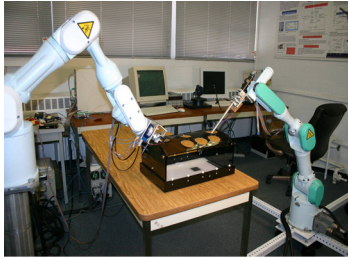




# John F. Kennedy Space Center's Ground Lightning Monitoring System



## BENEFITS

- Passive—no power required at the sensor location
- Protection from data corruption—majority of signal path is optical fiber
- Compact three-axis sensor is a 4" cube that weighs about 1 pound

NASA JSC/KSC and the Naval Research Laboratory (NRL) jointly developed the Ground Lightning Monitoring System (GLMS) to detect the indirect effects of lightning strikes after NASA's legacy systems were determined inadequate. GLMS determines the location of lightning and measures two independent sets of parameters: power bus voltages on the Orbiter and the change in magnetic field ( $db/dt$ ) inside and outside the Space Shuttle Vehicle (SSV).

NASA uses two separate weather systems at KSC—the National Lightning Detection Network (NLDN) and the Cloud-to-Ground Lightning Surveillance System (CGLSS) II, which provide the lightning maximum current ( $\pm 20\%$ ) and location data—to calculate a magnetic field at the SSV location. Because the Orbiter's protective skin and the Rotating Service Structure attenuate the magnetic field caused by lightning, the magnetic field inside the SSV may be stronger or weaker than the value NLDN and CGLSS II calculate. However, GLMS reports actual magnetic-field strength. To illustrate the superior performance of GLMS, a lightning strike during the fueling of STS-128 would have prompted a retest of the SSV systems if the only indication of internal magnetic-field strength had been the calculated data. But the internal magnetic-field data reported by GLMS allowed operations to proceed without retesting the SSV systems.

## APPLICATIONS

Monitoring high-value and sensitive systems for potential damage caused by magnetic fields:

- Computer systems/servers
- Data centers
- Power generation facilities
- Electronic equipment
- Airports

## TECHNOLOGY STATUS

- ☒ Patent pending
- ☐ U.S. patent
- ☐ Copyrighted
- ☒ Available to license
- ☐ Available for no-cost transfer
- ☒ Seeking industry partner for further codevelopment

## Technology Details

The GLMS uses digitizers that convert signals from copper to optical fiber close to the measurement point to reduce the potential for data corruption. It uses a magnetic ( $db/dt$ ) sensor system (developed at the NRL) that has three-axis ( $x,y,z$ ) fiber-optic sensor heads and cabling, as well as computers and transient recording equipment with sampling rates above 2 million samples per second. Since the GLMS is primarily fiber, the system is not susceptible to distortion or data corruption, and no amplification is required for sensors within 5 miles of the avionics unit. GLMS was successfully tested by Lightning Technologies Incorporated, in early 2008.

## Partnership Opportunities

All NASA licenses are individually negotiated with the prospective licensee, and each license contains terms concerning commercialization (practical application), license duration, royalties, and periodic reporting. NASA patent licenses may be exclusive, partially exclusive, or nonexclusive. If your company is interested in the Ground Lightning Monitoring System, or if you desire additional information, please reference Case Number KSC-13221 and contact:

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